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AF/8871

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Seiji UMEMOTO, et al.

Appln. No.: 09/851,970

Confirmation No.: 4097

Filed: May 10, 2001

For: REFLECTON TYPE LIQUID-CRYSTAL DISPLAY DEVICE

Docket No: Q64435

Group Art Unit: 2871

Examiner: Timothy L. RUDE

SUBMISSION OF APPELLANT'S BRIEF ON APPEAL

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an original and two copies of Appellant's Brief on Appeal. A check for the statutory fee of $330.00 is attached. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

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01 FC:1402 330.00 OP

Respectfully submitted,

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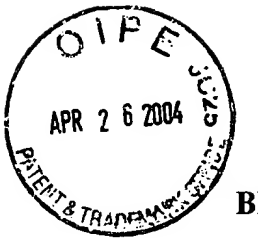
WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: April 26, 2004



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APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 1.192, Appellant submits the following:

I. REAL PARTY IN INTEREST

The real party in interest is NITTO DENKO CORPORATION by virtue of an assignment executed by Seiji Umemoto, Toshihiko Ariyoshi and Takao Suzuki (hereinafter "Appellants"), on April 26, 2001.

II. RELATED APPEALS AND INTERFERENCES

To the best of the knowledge and belief of Appellant, the Assignee and the undersigned, there are no other appeals or interferences before the Board of Appeals and Interferences ("the Board") that will directly affect or be affected by the Board's decision in the present Appeal.

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III. STATUS OF CLAIMS

Claims 1-19 are all the claims pending in the application.

Claim 1 stands provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over: (1) claims 1-8 of co-pending application 09/898,060; (2) claims 1-9 of co-pending application 09/833,941; (3) claims 1-22 of copending application no. 09/878,268; and (4) claims 1-38 of co-pending application 10/225,532. As these rejections are provisional in nature, they are not currently Appealed.

Claims 1-8 and 12-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Masuda et al.* (US 6,340,999; hereinafter "*Masuda*").

Claims 9-11 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Masuda* in view of *Yano et al.* (JP 11-326903; hereinafter "*Yano*").

Claims 18 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Masuda* in view of *Nemoto et al.* (US 6,456,344; hereinafter "*Nemoto*").

IV. STATUS OF AMENDMENTS

An *Amendment Under 37 C.F.R. § 1.116* was filed on December 29, 2003, in response to the final Office Action dated September 25, 2003, however, this Amendment did not modify the claims. Another *Amendment Under 37 C.F.R. § 1.116* is filed herewith to correct two informalities in claims 12 and 17 that have recently been discovered. No other amendment or response was filed subsequent to the final rejection.

V. SUMMARY OF THE INVENTION

V(1) General Description of the Invention

Appellant's invention relates to a reflection type liquid-crystal display device which can be used both in an external light mode and in an illumination mode.

V(2) Description of the Related Art

Related art reflection type liquid-crystal devices are provided with a front-lighting system using a side-light pipe (as shown in FIG. 6 of Unexamined Japanese Patent Publication No. Hei. 11-250715, reproduced to the right). However, it is difficult to reduce the thickness and weight of such systems, as such a side-light type light pipe needs a plate thickness of about 2 mm or larger for light transmission. If optical members such as a light-diffusing plate, etc. are disposed on the light pipe, the thickness in total is generally increased to 3 mm or larger.

【図6】

V(3) Description of the Invention and Relation to the Claims

As a matter of example to more fully explain the invention, Appellant will describe the reflection type liquid crystal device shown in the exemplary embodiments of the invention, which are illustrated in FIGS. 1-8 and described in detail on pages 7-65 of the Specification. Portions of appealed claims 1-19 that correspond to the features shown in the exemplary embodiments are also referenced during this discussion, per the requirements of *MPEP § 1206.*[1]

[1] Independent claim 1 is discussed in detail. In the interest of brevity, only the dependent claims specifically argued as being separately patentable over the applied references are discussed in detail.

This discussion of the exemplary embodiment and the pending claims is provided for explanatory purposes only, and is not intended to limit the scope of the claims in any way.

Exemplary embodiments of the reflection type liquid-crystal display device according to the invention are shown in Figures 1 and 2 of the Application, reproduced below.

FIG. 1

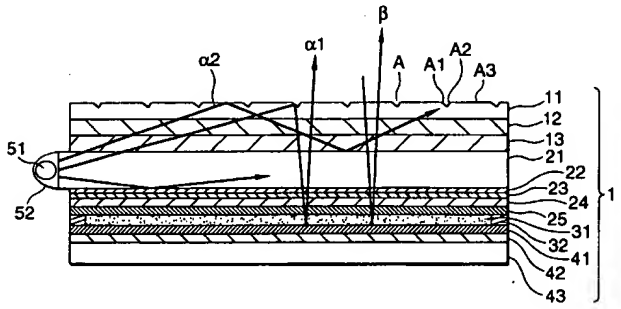
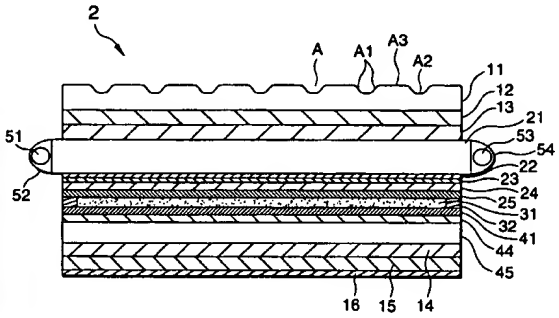


FIG. 2



The reflection type liquid-crystal display panels 1 and 2 include optical path control layers 11, which have optical path changing slopes A1. Below optical path control layers 11 are arranged polarizers 12 and phase retarders 13.

Next, visual side substrates are provided, comprising, *inter alia*, transparent substrates 21, low-refractive-index transparent layers 22, color filters 23, and transparent electrodes 24. The low-refractive-index transparent layers 22 have a lower reflective index than the transparent substrate 21. Below these features are arranged aligned film 25, liquid crystal 31, sealing material 32 and aligned films 41. Liquid crystal 31 is driven by the transparent electrodes 24 and 44 or the reflection type electrode 42.

Below aligned film 41 in the embodiment depicted in Figure 1, there is simply arranged a reflector 42 and back side substrate 43. In the embodiment depicted in Figure 2, an electrode 44, back side substrate 45, phase retarder 14, polarizer 15 and reflector 16.

These features correspond to the following portion of independent claim 1:

> 1. A reflection type liquid-crystal display device comprising:
>
> a reflection type liquid-crystal display panel including a liquid-crystal cell and a reflector, said liquid-crystal cell having a visual-side substrate, a back-side substrate and a liquid crystal, said visual-side substrate including a transparent substrate, a low-refractive-index transparent layer lower in refractive index than the transparent substrate, and a transparent electrode, said back-side substrate having an electrode, said liquid crystal being held between said visual-side and back-side substrates so that respective electrode sides of said visual-side and back-side substrates are disposed opposite to each other, said reflector being disposed on the back-side substrate side ...

Illuminators 51 are arranged on side surfaces of the liquid-crystal display panels so that illumination light emitted therefrom is incident on the side surface of the liquid-crystal display panel. This feature corresponds to the following portion of independent claim 1:

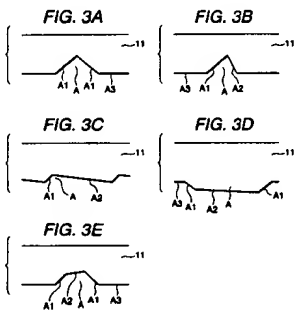
> ... at least one illuminator disposed on one of side surfaces of said reflection type liquid-crystal display panel; and ...

The reflection type liquid-crystal display operates by reflecting incident light by the reflector (16 or 42) and controlling that light by use of liquid crystal 31 before displaying that light from the visual side.

Regarding the low-refractive-index transparent layer 22, when incident light from the illuminator 51 is transmitted inside the visual-side substrate 21, the transmitted light is totally reflected on the basis of the refractive index difference between the substrate 21 and the transparent layer 22. Hence, the transmitted light is efficiently transmitted to the optical path changing slopes of the optical path control layer in a position far from the illuminator, and improves the uniformity of brightness on the whole display screen.

Additionally, the low-refractive-index transparent layer prevents uneven lighting due to birefringence or scattering when the transmitted light enters the liquid-crystal layer, and prevents the transmitted light from being rapidly absorbed in a color filter (when used).

Regarding the optical path layer 11, this feature is provided to change the optical path of transmitted light from illuminator 51 by utilizing optical path changing slopes A1 to direct the light toward the back-side substrate (43 or 45), which in turn reflects (by reflector 42) the light so that it may be used as illumination light (display light).



To achieve this, the optical path changing slopes A1 are arranged in a repetitive structure, and are inclined at an angle from 35 to 48 degrees with respect to a horizontal plane of the panels. Figs. 3A to 3E show examples of shapes of optical path changing means A. The refractive index of optical path layer 11 is higher than that of the low-refractive-index transparent layer provided on the visual-side substrate, so that light will not be enclosed in the visual-side substrate.

If the inclination angle is smaller than 35 degrees, the optical path of the light reflected by the reflector is displaced largely from the frontal direction, and the frontal luminance becomes low. In contrast, if the inclination angle exceeds 48 degrees, light leaking from the optical path changing slopes increases.

These features correspond to the following portion of independent claim 1:

> 1. A reflection type liquid-crystal display device comprising:
>
> ... an optical path control layer having a repetitive structure of optical path changing slopes on an outer side of said visual-side substrate and being higher in refractive index than said low-refractive-index transparent layer, each of said optical path changing slopes being inclined at an inclination angle in a range of

from 35 to 48 degrees with respect to a reference plane of said visual-side substrate.

Additionally, as shown above in FIGS. 1 and 2, low-refractive-index transparent layer is arranged between transparent substrate 21 and transparent electrode 24. This corresponds to dependent claim 2's recitation that the "low-refractive-index transparent layer is disposed between said transparent substrate and said transparent electrode, and there is a difference in refractive index by 0.05 or more between said low-refractive-index transparent layer and said transparent substrate."

As shown above, both of the embodiments shown in FIGS. 1 and 2 provide polarizers 12 and phase retarders 13, while FIG. 2 shows another phase retarder 14 and polarizer 15. These features correspond to claim 4's recitation of "one or two polarizers disposed on one of or each of opposite sides of said liquid-crystal cell," and claim 5's recitation of "at least one layer of phase retarder disposed between said liquid-crystal cell and said polarizer."

Figures 4, 5 and 6 illustrate arrangements of optical path changing slopes.

FIG. 4

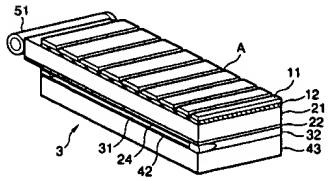


FIG. 5

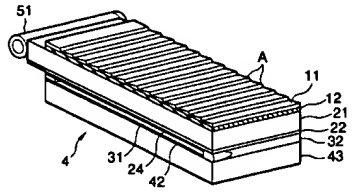
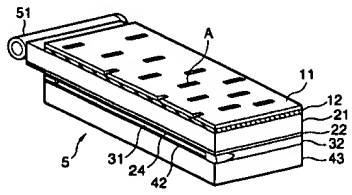


FIG. 6

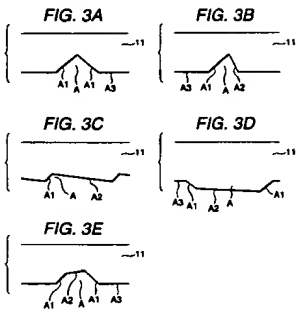


In these examples, the plurality of optical path changing means A may be formed continuously from one end of the optical path control layer to the other end as illustrated in Figs. 4 and 5, or may be formed discontinuously and intermittently as illustrated in Fig. 6.

These features correspond to dependent claim 9's recitation that the "prism-like concave portions are constituted by discontinuous grooves each having a length not smaller than 5 times

as large as a depth of said groove," and claim 11's recitation that the "prism-like concave portions are constituted by discontinuous grooves disposed at random."

As noted above, FIGS. 3A - 3E show various configurations of the prism like structures formed in the optical path control layer. These configurations provide single or multiple optical path changing slopes (*e.g.*, A1, A2). These features correspond to claim 12's recitation that "each of said prism-like structures in said optical path control layer is constituted by a concave or convex portion shaped, in section, substantially like a triangle or quadrangle having at least two optical path changing slopes facing said illuminator."



Additionally, the instant Application indicates in paragraph 0055 that "when the optical path control layer is formed independently as a transparent sheet, or the like, it is preferable that the transparent sheet, or the like, is bonded to the liquid-crystal display panel through an adhesive layer having a refractive index higher than that of the low-refractive-index transparent layer." This feature corresponds to dependent claim 15's recitation that the "optical path control layer is made of a transparent sheet, and is bonded to said liquid-crystal display panel through an adhesive layer having a refractive index higher than that of said low-refractive-index transparent layer."

Additionally, the instant Application indicates in paragraph 0021 that the plan sizes of the visual-side substrate and back-side substrate may be different, so that the side surface of visual visual-side substrate 21 is protruded further from the side of the display panel than the respective back-side substrate (43 or 45). This feature corresponds to dependent claim 18's recitation that

"at least one side surface of said visual-side substrate is protruded outward from that of said back-side substrate; and each illuminator is disposed on said protruded side surface of said visual-side substrate."

Additionally, the instant Application indicates in paragraph 0035 that the illuminator 51 may be formed in assisting means such as a light source holder 52 (or 54) for surrounding the illuminator to guide divergent light to the side surface of the liquid-crystal display panel. This feature corresponds to dependent claim 19's recitation that "each illuminator is disposed and held on said side surface of said visual-side substrate in such a manner that said illuminator is enclosed by a reflection type light source holder and end portions of said light source holder are bonded to end portions of upper and lower surfaces of said visual-side substrate."

VI. ISSUES

(A) Whether or not claims 1-8 and 12-14 are unpatentable over *Masuda* under 35 U.S.C. § 103(a).

(B) Whether or not claims 9-11 and 15-17 are unpatentable over *Masuda* in view of *Yano* under 35 U.S.C. § 103(a).

(C) Whether or not claims 18 and 19 are unpatentable over *Masuda* in view of *Nemoto* under 35 U.S.C. § 103(a).

VII. GROUPING OF CLAIMS

Independent claim 1, along with dependent claims 3, 6, 7, 8 and 14, stands or falls as a group (Group 1).

Dependent claim 2 stands or falls alone (Group 2).

Dependent claims 4 and 5 stand or fall as a group (Group 3).

Dependent claims 9 and 10 stand or fall as a group (Group 4).

Dependent claim 11 stands or falls alone (Group 5).

Dependent claims 12 and 13 stand or fall as a group (Group 6).

Dependent claims 15, 16 and 17 stand or fall as a group (Group 7).

Dependent claim 18 stands or falls alone (Group 8).

Dependent claim 19 stands or falls alone (Group 9).

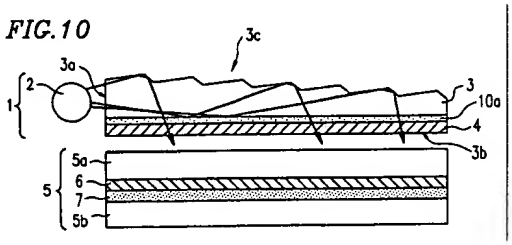
VIII. ARGUMENTS

(VIII)(A) Independent Claim 1 - The Applied Reference

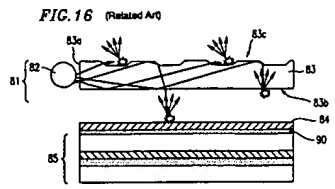
Independent claim 1 is rejected only in view of *Masuda*. *Masuda* discloses a front light reflective type Liquid Crystal Display ("LCD") apparatus (col. 1, lines 6-10). The Examiner specifically alleges that the third embodiment of *Masuda*, shown in FIG. 10, has relevance to the features recited in claim 1.

FIG. 10 of *Masuda* (reproduced to the right) discloses a reflective type liquid crystal display 5, consisting of glass substrate 5a, liquid crystal layer 6, reflector 7, and glass substrate 5b. A separate front light 1 consisting of a light guide 3, low refractive resin layer 10a, and a polarization selecting section 4 is arranged above glass substrate 5. Front light 1 is not part of reflective type liquid crystal display 5.

FIG. 10



Masuda discloses that the arrangement shown in FIG. 10 is superior to the prior art device shown in FIG. 16 (reproduced to the right). In the FIG. 16 arrangement, light passes directly from the front light 82 to liquid crystal display device 85, which may result in bright spots. In the FIG. 10 arrangement, the polarization selecting section 4 is arranged on light guide 3, so that light must pass through it before being transmitted to the liquid crystal display device 5. This arrangement reduces bright spots (see col. 6, lines 1-20).



Thus, the entire purpose of *Masuda* is to improve systems that utilize separate front lights 1 and reflective type liquid crystal displays 5, not devices that provide a single reflection type liquid crystal display device similar to the invention. In fact, *Masuda* indicates that devices that utilize attached liquid crystal cells and light guides, such as the invention, do not provide polarizing plates or phase plates, as used by the inventive devices of *Masuda*, and that such devices are difficult to manufacture (*see* col. 3, line 61 - col. 4, line 4).

(VIII)(B) Independent Claim 1 - The Examiner's Position

The Examiner alleges that FIG. 10 of *Masuda* (discussed above) discloses all of the features recited in independent claim 1, specifically (*see* page 5 of the Final Office Action):

> a reflection type liquid-crystal device comprising: a reflection type liquid crystal display panel, 5, including a liquid crystal cell and a reflector, 7, said liquid crystal cell having a visual side substrate, a back-side substrate, 5b, and a liquid crystal, 6, said visual-side substrate including a light guide, 3 (Applicant's transparent substrate), a low-refractive resin layer, 10a (Applicant's transparent layer), lower in reflective index (1.38, col. 15, lines 35-39) than the transparent substrate (1.49, col. 15, lines 35-39), and a transparent electrode (not shown), said back-side substrate having an electrode (not shown), said liquid crystal being held between said visual-side and back-side substrates so that respective electrode sides of said visual-side and back-side substrates are disposed opposite to each other, said reflector being disposed on the back-side substrate side (per

> Figure 10); at least one illuminator, 2, ... and an optical path control layer having a repetitive structure of optical path changing slopes, 3c...

The Examiner further alleges that:

> Masuda does not explicitly disclose and Applicant does not explicitly claim an optical path control layer having a repetitive structure of optical path changing slopes, on an outer side of said visual-side substrate that is not integral to the transparent substrate. However, making integral or making separable the parts of the visual-side substrate are species not considered patentably distinct.

Thus, as best as Appellants can determine, the Examiner is alleging that:

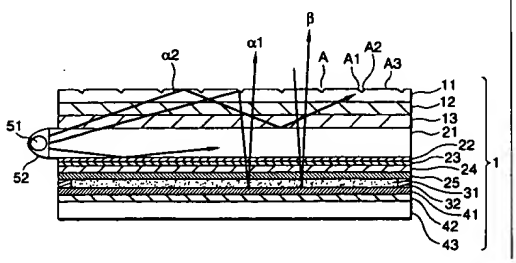
(a) the recited "visual side substrate" somehow corresponds to a combination of *Masuda's* light guide 3, low refractive resin layer 10a, polarization selecting section 4, glass substrate 5a, and the open space between section 4 and substrate 5a (the Examiner must include substrate 5a, because claim 1 recites the arrangement of a transparent electrode in the visual side substrate, and substrate 5a is the only reasonable location for such a transparent electrode);

(b) the recited "back side substrate," "liquid crystal" and "reflector" correspond to glass substrate 5b, liquid crystal 6 and reflector 7, respectively; and

(c) the recited "optical path control layer" corresponds to upper surface 3c.

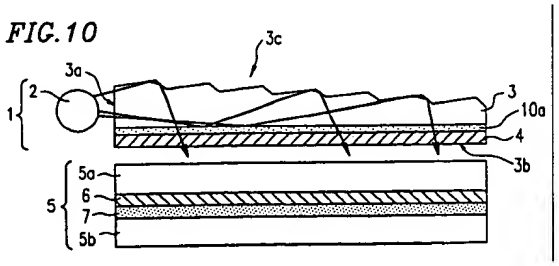
(VIII)(C) Independent Claim 1 - The Examiner's Interpretation of Masuda is Unreasonable

FIG. 1



Application

FIG. 10



Masuda

As can be easily seen in the above comparison, the respective structures of the exemplary embodiment of the invention shown in FIG. 1 and the cited embodiment of *Masuda* are quite different. These differences are reflected in the language of claim 1.

(VIII)(D) Independent Claim 1 - The Examiner's Identification of Multiple Discrete Layers Separated By Gaps As A Single "Substrate" Is Unreasonable

First, claim 1 recites a "visual side substrate" which includes a "transparent substrate" (*e.g.*, element 21 in FIG. 1), a "low refractive index transparent layer" (*e.g.*, element 22 in FIG. 1) and a transparent electrode (*e.g.*, element 24 in FIG. 1). As can be easily seen in FIG. 1, each of the exemplary elements 21, 22 and 24 are arranged in directly stacked layers, *i.e.*, there are no open spaces or voids arranged between these layers. This is consistent with the definition of "substrate" normally used in the relevant art.

In contrast, the Examiner's allegation that the separate light guide 3 and glass substrate 5a of *Masuda* somehow constitute a single "substrate" is both unreasonable and unsupported by *Masuda*. The Examiner has failed to explain why he thinks such separate pieces can form a single "substrate," or to cite a single example of a LCD arrangement that classifies discrete layers that are physically separated by an intervening gap as a single "substrate."

In fact, Appellant respectfully submits that the only reasonable reading of *Masuda* is that only glass substrate 5a corresponds to the recited "visual-side substrate."

(VIII)(E) Independent Claim 1 - The Examiner's Identification of A Single Element of Masuda As Both The Recited "Visual Side Substrate" and "Optical Path Control Layer" Is Unreasonable

Additionally, claim 1 recites "an optical path control layer" (*e.g.*, element 11 in FIG. 1) "on an outer side of said visual-side substrate" (*e.g.*, a combination of elements 21, 22 and 24).

As discussed above, FIG. 1 of the Application shows this arrangement, where element 11 is a discrete "layer" arranged "on" the "visual-side substrate" (supported by intervening layers 12 and 13). This is consistent with the definition of "layer" normally used in the relevant art.

In contrast, the Examiner's allegation that upper surface 3c of *Masuda* corresponds to the "optical path control layer" and is somehow different from the light guide 3 itself, is both unreasonable and unsupported by *Masuda*. First, a "layer" and a "surface" are two quite different features, as a "layer" necessarily requires a thickness, while a "surface" does not. Further, even if the upper surface 3c could be considered a "layer," it is not a discrete portion identifiably different from light guide 3 of *Masuda*.

In fact, Appellants respectfully submit that the only reasonable interpretation of *Masuda* is that light guide 3 corresponds to the recited "optical path control layer," and that (as discussed above) glass substrate 5a corresponds to the recited "visual side substrate."

(VIII)(F) Independent Claim 1 - Masuda Fails To Teach Or Suggest That The Recited "Optical Path Control Layer" Is Arranged "On An Outer Side Of Said Visual Side Substrate."

In view of the above explanation, Appellants respectfully submit that *Masuda* fails to teach or suggest *at least* an "optical path control layer having a repetitive structure of optical path changing slopes on an outer side of said visual side substrate," as recited in independent claim 1.

Specifically (as discussed above), *Masuda* discloses a device utilizing a *separate* light guide 3 (the only portion that reasonably could be compared to the "optical path control layer) and glass substrate 5a (the only portion that reasonably could be compared to the "visual side

substrate). As these portions are separate, they are not "on" one another, *i.e.,* there is no teaching or suggestion that the "optical path control layer" is "on" the "visual side substrate."[2]

Further, there is no teaching or suggestion to modify *Masuda* to eliminate the spacing between these features, as *Masuda* specifically indicates that such a combined system (akin to its prior art FIG. 17) would not utilize the disclosed light control section, and is difficult to manufacture.

(VIII)(G) Independent Claim 1 - Masuda Fails To Teach Or Suggest All Of The Features Of The Recited "Visual Side Substrate"

In view of the above explanation, Appellants respectfully submit that *Masuda* fails to teach or suggest *at least* a "visual-side substrate" that includes "a low-refractive-index transparent layer lower in refractive index than the transparent substrate," as recited in independent claim 1.

First, as discussed above, the portion in *Masuda* compared by the Examiner to the recited "low-refractive-index transparent layer," low refractive resin layer 10a, is located in the separate front light 1, not in the glass substrate 5a. Thus, it cannot teach or suggest a "low-refractive-index transparent layer" located in a "visual-side substrate."

Further, the only portion of *Masuda* that could be compared to the "visual-side substrate," glass substrate 5a, is silent regarding any component parts thereof, or any refractive index thereof.

[2] Of course, "on" should not be read as eliminating constructions having intervening layers, such as are shown in FIGS. 1 and 2 of the Application.

Thus, even if the gap could be eliminated between front light 1 and liquid crystal display device 5, *Masuda* fails to teach or suggest that the refractive index of low refractive resin layer 10a is "lower than glass substrate 5a (the only portion that can reasonably be compared to the recited "transparent substrate").

(VIII)(H) Independent Claim 1- Masuda Fails To Teach Or Suggest The Recited Optical Path Changing Slopes Inclined In A Range of From 35 to 48 Degrees

Lastly, independently of the issues discussed above, Appellants respectfully submit that *Masuda* fails to teach or suggest *at least* "an optical path control layer" having "optical path changing slopes being inclined at an inclination angle in a range of from 35 to 48 degrees with respect to a reference plane of said visual-side substrate," as recited in independent claim 1.

In the Final Office Action, the Examiner alleges (*see* pg. 6) that the optical path changing slopes are inclined 35-48°, "as graphically illustrated by the light path arrow in the upper portion of Figure 10."

Additionally, in response to Appellants arguments in the July 10, 2003 Amendment that such angles are not disclosed because the drawings are not indicated as being to scale (see MPEP § 2125), the Examiner agrees that "drawings that are not to scale are generally of little value when making determinations as to dimensions." However, the Examiner also curiously alleges that drawings "tend to be quite reliable for ray traces, because the drawing must convey the path of the ray" and that "the drawings of *Masuda* clearly indicates a ray path that makes a turn of about 90° which would be achieved with slopes of 35-48°" (*see* Office Action, pg. 16).

Appellants respectfully disagree with the Examiner's entire premise. The Examiner's concession that "drawings that are not to scale are of little value when making determinations as

to dimensions" is correct, and Applicants respectfully submit that angular measurements are "dimensions" just as the other features of the drawings are.

Accordingly, it only stands to reason that a drawing that is not to scale cannot provide ray traces that are to scale, for, as the relative dimensions of the drawing change, the ray traces will also change. Thus, it is respectfully submitted that the Examiner's belief that unscaled ray traces are somehow more accurate than other dimensions in unscaled drawings is incorrect.[3]

Further, although the Examiner indicates that reverse engineering the alleged slopes of *Masuda* based on measuring the turn of the unscaled ray traces would have somehow resulted in the determination of a slope within the claimed range (O.A., pg. 16, last 4 lines), he cites no reference that discloses such a process. In fact, the Examiner's entire premise that the slope can easily be determined since the ray traces make a turn of approximately 90° is flawed, as each of the rays shown in FIG. 10 of *Masuda* are reflected twice, first off the top surface of light guide 3, and then off the stepped surface (the alleged slope).

Still further, the Examiner's final allegation that "*Masuda* clearly teaches the angle as a results effective variable," citing MPEP § 2144.05, is also incorrect. As indicated in MPEP § 2144.05(II)(B), "a particular parameter must first be recognized as a result-effective variable, *i.e.*, a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

[3] The Examiner cites no case law or MPEP section to support this assertion.

Here, the instant Application indicates, in paragraph [0043], that:

> The aforementioned optical path changing slopes A1 play the following role. That is, of the light incident on the side surfaces from the illuminators and the transmitted light of the incident light, the slopes A1 reflect the light incident thereon to change the optical path of the light to thereby supply the light to the back side of the liquid-crystal display panel. In this case, the inclination angle of the optical path changing slopes A1 with respect to the reference plane is set to be in a range of from 35 to 48 degrees. Thus, as represented by the broken-line arrow in Fig. 1, the optical path of the light incident on the side surfaces or transmitted light thereof can be changed with good perpendicularity to the reference plane so that display light excellent in frontal directivity can be obtained efficiently. If the aforementioned inclination angle is smaller than 35 degrees, the optical path of the light reflected by the reflector is displaced largely from the frontal direction. Thus, it is difficult to use the reflected light effectively for display, and the frontal luminance becomes low. On the contrary, if the inclination angle exceeds 48 degrees, light leaking from the optical path changing slopes increases due to the contrariety to the condition that light incident on the side surfaces or transmitted light thereof is totally reflected. Thus, the efficient utilization of the light incident on the side surfaces is deteriorated.

Thus, the instant Application recognizes that the angular position of the slopes A1 has a direct effect on the frontal directivity of the display light. In contrast, there is simply no indication that *Masuda* is at all aware of this property. In fact, the rays reflected rearward by the interface of surface 3c and the outside air is reflected at angles far from perpendicular, which would have a deleterious effect on the frontal directivity of display light.

Thus, it cannot reasonably be argued that *Masuda* discloses any particular attention to the frontal directivity of light achieved by the specific arrangement of the optical path changing slopes of the invention. Thus, the recited angles of these slopes cannot be considered a result effective variable.

Therefore, due at least to the reasons discussed above, Appellants respectfully submit that independent claim 1 is patentable over the applied reference. Further, Appellants respectfully submit that rejected dependent claims 2-19 are allowable, *at least* by virtue of their dependency.

(VIII)(I) Dependent Claim 2

Dependent claim 2 recites, *inter alia*, that the "low-refractive-index transparent layer is disposed between said transparent substrate and said transparent electrode."[4] Appellants respectfully submit that these features are separately patentable over *Masuda*.

As discussed above, the only portion of *Masuda* that could reasonably be read as the "visual-side substrate" is glass substrate 5a. *Masuda* fails to teach or suggest any discernable "low-refractive-index transparent layer" or "transparent electrode" within glass substrate 5a, at least to the extent required to determine their relative positions.

(VIII)(J) Dependent Claim 4

Regarding claim 4, Appellants respectfully submit that *Masuda*, at least as the Examiner is currently construing it, cannot teach or suggest that the "liquid-crystal display panel further includes one or two polarizers disposed on one of or each of opposite sides of said liquid-crystal cell."[5]

Specifically, as discussed above with respect to claim 1, the Examiner has alleged that a combination of light guide 3 and glass substrate 5a (and the features therebetween) corresponds to the recited "visual side substrate." As recited in claim 1, the "visual side substrate" is part of the "liquid crystal cell." As noted directly above, the recited "polarizers" are arranged on at least one side of the "liquid crystal cell."

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[4] Claim 2 is separately patentable over independent claim 1 due to this recitation of a particular location for the low-refractive-index transparent layer.

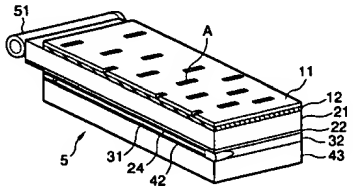
[5] Claim 4 is separately patentable over independent claim 1 due to this recitation of the additional feature of a polarizer, along with its location.

However, the polarization section 4 of *Masuda* alleged by the Examiner to correspond to the recited "polarizer," is not located on a "side" of the alleged "liquid crystal cell." Rather, it is located within what the Examiner has alleged to be the "liquid crystal cell" (a combination of light guide 3 and glass substrate 5a).

(VIII)(K) Dependent Claim 9

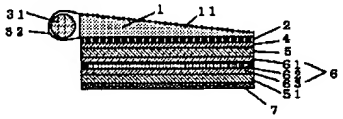
Dependent claim 9 further describes the concave prism-like structures formed in the optical path control layer first described in claims 6 and 7, reciting that the "prism-like concave portions are constituted by discontinuous grooves each having a length not smaller than 5 times as large as a depth of said groove."[6] An example of the recited relationship is shown in FIG. 6, reproduced to the right, where grooves A are discontinuous.

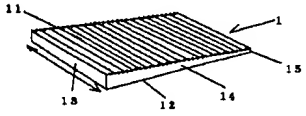
FIG. 6



The Examiner concedes that *Masuda* fails to teach or suggest these features (pg. 11 of the Final Office Action). Nevertheless, the Examiner alleges that *Yano* discloses grooves "arranged discontinuously as intermittent heights or a crevice [0044] and Drawings 1-4."

Yano discloses a LCD as shown in the reproduced Figures to the right.





Specifically, *Yano* discloses a light guide plate 1 arranged atop a liquid crystal display element 6. A light source is arranged adjacent to the side of light guide plate 1.

As clearly shown in FIG. 4, *Yano's* light guide plate has grooves that extend completely across the light guide plate 1 in an unbroken manner. Accordingly, Appellants respectfully submit that *Yano* fails to teach or suggest any "discontinuous" grooves.

Regarding the section of *Yano* cited by the Examiner, paragraph [0044], it is completely unclear what structure *Yano* is disclosing relative to the "heights" and "crevices" cited by the Examiner in paragraph [0044]. Accordingly, the Examiner has not established *prima facie* obviousness. If the Examiner wishes to rely on *language* from *Yano*, he should endeavor to obtain a manual English translation, and not rely on confusing machine translations of optional features.

In any event, even if the varying "heights" and "crevices" of paragraph [0044] could somehow be read as describing the grooves of light guide plate 1, these descriptions do not indicated that the grooves would be "discontinuous." A varying groove depth does not make the groove discontinuous.

Further, even assuming that the vague disclosure of paragraph [0044] could be read to disclose "discontinuous" grooves, there is simply no teaching or suggestion that these grooves would have "a length not smaller than 5 times as large as a depth of said groove."

Further, in contrast to the Examiner's assertion, there is simply no teaching or suggestion in *Yano* (or, for that matter, *Masuda*) that groove length is a result effective variable.

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[6] Claim 9 is separately patentable over claim 7 due to this recitation of discontinuous grooves.

Accordingly, one of skill would not have been motivated to modify the lengths as the Examiner alleges.

(VIII)(L) Dependent Claim 11

Dependent claim 11 further describes the concave prism-like structures formed in the optical path control layer first described in claims 6 and 7, reciting that the "prism-like concave portions are constituted by discontinuous grooves disposed at random."[7]

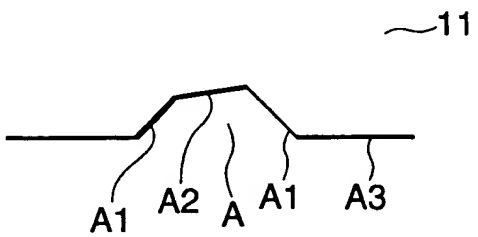
As discussed above, the Examiner has conceded that *Masuda* fails to teach or suggest "discontinuous" grooves. Further, although the Examiner has applied *Yano* in an attempt to show that the features recited in claim 11 are obvious, he has not explained how *Yano* teaches or suggests "discontinuous grooves disposed at random." In fact, no such discontinuous grooves are taught or suggested, for at least the reasons discussed above with respect to claim 9. Accordingly, the Examiner has not established prima facie obviousness with respect to claim 11.

Additionally, Appellants respectfully submit that there is simply no teaching or suggestion of any "random" placement of grooves in *Yano*.

(VIII)(M) Dependent Claim 12

Claim 12 further describes the prism-like structures in the optical path control layer described in claim 6, reciting that "each of said prism-like structures in said optical path control layer is constituted by a

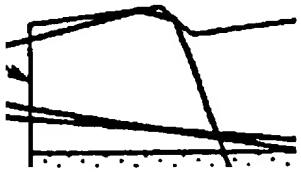
FIG. 3E



[7] Claim 11 is separately patentable over claim 7 due to this recitation of discontinuous grooves disposed at random.

concave or convex portion shaped, in section, substantially like a triangle or quadrangle having at least two optical path changing slopes facing said illuminator."[8] An example of a prism-like structure with two optical path changing slopes facing an illuminator is shown by slopes A1 and A2 in FIG. 3E to the right.

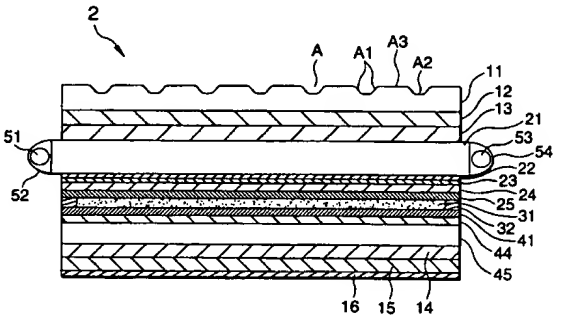
The Examiner alleges that the embodiment shown in FIG. 10 of *Masuda* discloses these features. A relevant portion of FIG. 10 is shown to the right. As can be clearly seen, the embodiment in FIG. 10 of *Masuda* only discloses a single slope of its surface "facing" the illuminator.



(VIII)(N) Dependent Claim 13

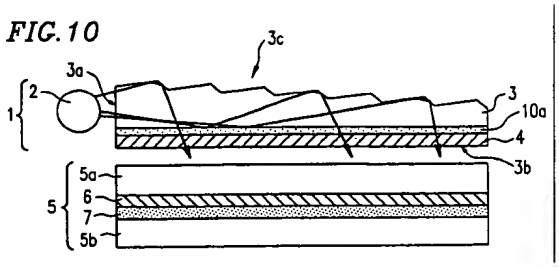
Claim 13 further recites that "illuminators are disposed on at least two of side surfaces of said liquid-crystal display panel."[9] An example of the use of two illuminators is shown in FIG. 2 of the application, reproduced to the right. Note that two illuminators 51 and 53 are provided.

FIG. 2



The Examiner alleges that it would have been obvious to utilize two illuminators in the embodiments of *Masuda*, because "it has been held

FIG. 10



[8] Claim 12 is separately patentable over claim 6 due to this recitation of two optical path changing slopes facing the illuminator.

[9] Claim 13 is separately patentable over claim 13 due to this recitation of a second illuminator.

that mere duplication of the essential working parts of a device involves only routine skill in the art. However, the embodiments of Masdua, such as FIG. 10 shown to the right, utilize light guides 3 that reduce in height over the length of the front light 1, and have structures otherwise particularly adapted to the arrangement of a single light source 2.

Accordingly, Appellants respectfully submit that one of skill would not have been motivated to modify the embodiments of *Masuda* to utilize two light sources, as such a modification would necessarily change the principle of operation of *Masuda*, which is indicative of non-obviousness. *See In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) MPEP § 2143.01.*

(VIII)(O) Dependent Claim 15

Claim 15 recites that the "optical path control layer" described in claim 1 "is made of a transparent sheet, and is bonded to said liquid-crystal display panel through an adhesive layer having a refractive index higher than that of said low-refractive-index transparent layer."[10]

The Examiner concedes that *Masuda* fails to teach or suggest these features. Nevertheless, the Examiner alleges that *Yano* discloses "the use of a transparent glue (Applicants' tacky adhesive layer) having a refractive index of 1.40-1.55." Further, the Examiner alleges that one of ordinary skill in the art at the time of the invention would used the transparent glue of *Yano* to bind the portions alleged to correspond to the recited "optical path control layer" and "liquid crystal display panel" in *Masuda.*

[10] Claim 15 is separately patentable over independent claim 1 due to its additional description of the optical path control layer and its recitation of an adhesive layer.

However, there would have been no teaching or suggestion to utilize the transparent glue of *Yano* in the way alleged by the Examiner.

Specifically, the Examiner has alleged that the portion of *Masuda* that corresponds to the recited "optical path control layer" is upper surface 3c, and that the remaining portion of light guide 3 is part of the "liquid crystal display panel."

This unreasonable interpretation of *Masuda*, as discussed above, is even more apparent in this context. First, it is unreasonable to argue that a surface 3c would be adhesively attached to the light guide 3. The surface is part of light guide 3, not a discrete portion separate from that element.

Second, the Examiner has not explained why one of skill in the art at the time of the invention would have been motivated to modify *Masdua* by splitting light guide 3 into two parts, and then attaching the separate parts via an adhesive with a specific refractive index.

Third, even if surface 3c could be considered a separate "layer," and even if the two layers could somehow be connected via "an adhesive layer having a refractive index higher than that of said low-refractive-index transparent layer," the arrangement would have a drastic affect on the light transmission properties of the light guide 3, and its interrelationship with liquid crystal display 5.

These effects alone would change the principle of operation of *Masuda*, and therefore the modification alleged by the Examiner is non-obvious. *See In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) MPEP § 2143.01.*

As an additional matter, the Examiner seems to be alleging that the light guide plate 1 of *Yano* is comparable to the recited "optical path control layer." This is a more reasonable identification than the Examiner's strained analysis of light guide 3 of *Masuda* (a very similar feature) as somehow being part of the liquid crystal display *vis-à-vis* claim 1.

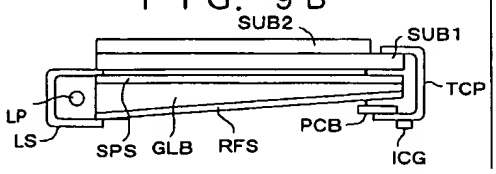
(VIII)(P) Dependent Claim 18

Claim 18 recites that "at least one side surface of said visual-side substrate is protruded outward from that of said back-side substrate," and that "each illuminator is disposed on said protruded side surface of said visual-side substrate."[11]

The Examiner concedes that *Masuda* fails to teach or suggest the features of claim 18, but that those features are disclosed by *Nemoto*. Specifically, the Examiner has alleged that *Nemoto* discloses "in Figure 9B the use of a protruded side surface with a light source holder, LS, bonded to end portions of upper and lower surfaces of transparent substrate, GLB, to comprise a lighted display assembly (col. 7, lines 27-32).

Figure 9B of *Nemoto* is reproduced to the right. This embodiment provides a lower transparent glass substrate SUB1 and an upper transparent glass substrate SUB2. A linear light source LP is arranged to the side of

FIG. 9B



[11] Claim 18 is separately patentable over independent claim 1 due to this recitation of the additional feature of a protruding visual side substrate, and location of the illuminator with respect to this feature.

light guide plate GLB. Reflecting sheets LS, RFS and diffusion sheet SPS are also provided. Thus, it is clear that *Nemoto* discloses a rear-light LCD system, which is quite different from the front light system of *Masuda*.

Here, the Examiner seems to again be alleging that one of ordinary skill would have been motivated to modify the embodiments of *Masuda* so that, for example, the light guide 3 and glass substrate 5a extend beyond the boundary of glass substrate 5b.

As an initial matter, Appellants respectfully submit that there is no teaching or suggestion of any motivation to modify *Masuda* as the Examiner alleges. As noted above, *Masuda* is a front light LCD display, while *Nemoto* is a rear light LCD display. Thus, substrate SUB1 is the substrate arranged on the visual side, not substrate SUB2 as the Examiner seems to allege. The Examiner has not explained why one of skill would have been motivated to modify the visual side substrate of *Masuda* similarly to the lower substrate features of the specific rear light LCD of *Nemoto*.

Further, even if one would have been motivated to modify *Masuda* in view of *Nemoto*, the resultant combination would fail to teach or suggest that "each illuminator is disposed on said protruded side surface of said visual-side substrate."

Specifically, *Nemoto* clearly discloses an arrangement where the illuminator is arranged on a side of the LCD opposite to the portions of substrate SUB1 that are allegedly protruding.

(VIII)(Q) Dependent Claim 19

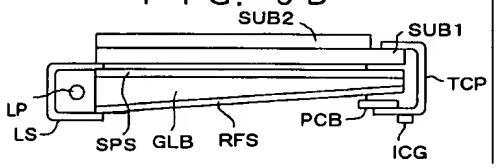
Claim 19 recites that "each illuminator is disposed and held on said side surface of said visual-side substrate in such a manner that said illuminator is enclosed by a reflection type light

source holder and end portions of said light source holder are bonded to end portions of upper and lower surfaces of said visual-side substrate."[12]

The Examiner concedes that *Masuda* fails to teach or suggest these features, but alleges that *Nemoto* corrects this deficiency, citing FIG. 9B.

However, Appellants respectfully submit that *Nemoto* also fails to teach or suggest the features recited in claim 12. Specifically, as shown in the reproduction of FIG. 9B to the right, *Nemoto* only discloses that its light source LP is arranged within a feature attached to a side surface of light guide plate GLB. However, light guide plate GLB cannot reasonably be read as being akin to the recited "visual-side substrate." Rather, as discussed above, substrate SUB2 is the visual side substrate.

FIG. 9B



IX. CONCLUSION

In view of the foregoing differences between appealed claims 1-19 and the cited references, the Appellant respectfully submits that appealed claims 1-19 are patentable over *Masuda*, *Yano* or *Nemoto*, either alone or in any reasonable combination.

The present Brief on Appeal is being filed in triplicate. Unless a check is submitted herewith for the fee required under 37 C.F.R. §1.192(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

[12] Claim 19 is separately patentable over independent claim 1 due to this recitation of the additional feature of a light source holder, along with its location.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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APPENDIX

CLAIMS 1-19 ON APPEAL:

1. (Previously Presented) A reflection type liquid-crystal display device comprising:

a reflection type liquid-crystal display panel including a liquid-crystal cell and a reflector, said liquid-crystal cell having a visual-side substrate, a back-side substrate and a liquid crystal, said visual-side substrate including a transparent substrate, a low-refractive-index transparent layer lower in refractive index than the transparent substrate, and a transparent electrode, said back-side substrate having an electrode, said liquid crystal being held between said visual-side and back-side substrates so that respective electrode sides of said visual-side and back-side substrates are disposed opposite to each other, said reflector being disposed on the back-side substrate side;

at least one illuminator disposed on one of side surfaces of said reflection type liquid-crystal display panel; and

an optical path control layer having a repetitive structure of optical path changing slopes on an outer side of said visual-side substrate and being higher in refractive index than said low-refractive-index transparent layer, each of said optical path changing slopes being inclined at an inclination angle in a range of from 35 to 48 degrees with respect to a reference plane of said visual-side substrate.

2. (Previously Presented) A reflection type liquid-crystal display device according to claim 1, wherein said low-refractive-index transparent layer is disposed between said transparent substrate and said transparent electrode, and there is a difference in refractive index by 0.05 or more between said low-refractive-index transparent layer and said transparent substrate.

3. (Original) A reflection type liquid-crystal display device according to claim 1, wherein at least said visual-side substrate in said liquid-crystal cell is made of an optically isotropic material.

4. (Original) A reflection type liquid-crystal display device according to claim 1, wherein said liquid-crystal display panel further includes one or two polarizers disposed on one of or each of opposite sides of said liquid-crystal cell.

5. (Original) A reflection type liquid-crystal display device according to claim 4, wherein said liquid-crystal display panel further includes at least one layer of phase retarder disposed between said liquid-crystal cell and said polarizer.

6. (Original) A reflection type liquid-crystal display device according to claim 1, wherein: said optical path control layer is constituted by a repetitive structure of prism-like structures; and each of said optical path changing slopes in said optical path control layer faces said illuminator.

7. (Original) A reflection type liquid-crystal display device according to claim 6, wherein each of said prism-like structures in said optical path control layer is constituted by a concave portion shaped substantially like a triangle in section.

8. (Original) A reflection type liquid-crystal display device according to claim 7, wherein each of said prism-like concave portions is constituted by a continuous groove which extends from one end to the other end of said optical path control layer in a ridgeline direction parallel with or inclined to said side surface of said liquid-crystal display panel on which said illuminator is disposed.

9. (Original) A reflection type liquid-crystal display device according to claim 7, wherein said prism-like concave portions are constituted by discontinuous grooves each having a length not smaller than 5 times as large as a depth of said groove.

10. (Original) A reflection type liquid-crystal display device according to claim 9, wherein the length of each of said discontinuous grooves in said prism-like concave portions is approximately parallel to said side surface of said liquid-crystal display panel on which said illuminator is disposed.

11. (Original) A reflection type liquid-crystal display device according to claim 7, wherein said prism-like concave portions are constituted by discontinuous grooves disposed at random.

12. (Amended Herewith) A reflection type liquid-crystal display device according to claim 6, wherein each of said prism-like structures in said optical path control layer is constituted by a concave or convex portion shaped, in section, substantially like a triangle or quadrangle having at least two optical path changing slopes facing said illuminator.

13. (Original) A reflection type liquid-crystal display device according to claim 12, wherein said illuminators are disposed on at least two of side surfaces of said liquid-crystal display panel.

14. (Original) A reflection type liquid-crystal display device according to claim 1, wherein said inclination angle of each of said optical path changing slopes in said optical path control layer is in a range of from 38 to 45 degrees.

15. (Original) A reflection type liquid-crystal display device according to claim 1, wherein said optical path control layer is made of a transparent sheet, and is bonded to said liquid-crystal display panel through an adhesive layer having a refractive index higher than that of said low-refractive-index transparent layer.

16. (Previously Presented) A reflection type liquid-crystal display device according to claim 15, wherein said adhesive layer is constituted by a tacky layer.

17. (Amended Herewith) A reflection type liquid-crystal display device according to claim 15, wherein each of the refractive index of said optical path control layer and the refractive index of said adhesive layer is higher by 0.05 or more than that of said low-refractive-index transparent layer.

18. (Original) A reflection type liquid-crystal display device according to claim 1, wherein: at least one side surface of said visual-side substrate is protruded outward from that of said back-side substrate; and

each illuminator is disposed on said protruded side surface of said visual-side substrate.

19. (Original) A reflection type liquid-crystal display device according to claim 1, wherein each illuminator is disposed and held on said side surface of said visual-side substrate in such a manner that said illuminator is enclosed by a reflection type light source holder and end portions of said light source holder are bonded to end portions of upper and lower surfaces of said visual-side substrate.